P ENT COOPERATION TREAT

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From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:
SCOTT WOLINSKY
VOLPE AND KOENIG, P.C.
UNITED PLAZA, SUITE 1600
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NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY REPORT ON PATAENTABILITY
(Chapter II of the Patent Cooperation Treaty)
(PCT Rule 71.1)

Applicant's or agent's file reference I-2-0526.1WO	Date of mailing (*day/month/year*) **IMPORTANT NOTIFICATION**

International ation No.	International filing date (*day/month/year*)	Priority date (*day/month/year*)
PCT/US03/38	03 December 2003 (03.12.2003)	16 December 2002 (16.12.2002)

Applicant
INTERDI AL T. ORA

1. The applic eby ed that t national Preliminary Examining A ority transmits herewith the international p. iminary report on paten ility and its annexes, if any, establish on the international application.

2. A copy of the report and its annexes, if any, is being tra mitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the *PCT Applicant's Guide*.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed invention is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the IPEA/ US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703)305-3230	Authorized officer for Michelle K. Lee Albert DeCady Telephone No. (572) 272-3819

Form PCT/IPEA/416 (January 2004)

DOCKETED FOR 6/16/05 - PCT 30 MONTH DEADLINE

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:
SCOTT WOLINSKY
VOLPE AND KOENIG, P.C.
UNITED PLAZA, SUITE 1600
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NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY REPORT ON PATAENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Rule 71.1)

Date of mailing *(day/month/year)*	20 DEC 2004
Applicant's or agent's file reference I-2-0526.1WO	**IMPORTANT NOTIFICATION**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US03/38223	03 December 2003 (03.12.2003)	16 December 2002 (16.12.2002)

Applicant

INTERDIGITAL TECHNOLOGY CORPORATION

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

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The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed invention is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

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PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference I-2-0526.1WO	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/US03/38223	International filing date *(day/month/year)* 03 December 2003 (03.12.2003)	Priority date *(day/month/year)* 16 December 2002 (16.12.2002)
International Patent Classification (IPC) or national classification and IPC IPC(7): H03M 13/35, 13/27 and US Cl.: 714/786, 790; 375/265		
Applicant INTERDIGITAL TECHNOLOGY C ORPORATION		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:

a. ☒ *(sent to the applicant and to the International Bureau)* a total of 13 sheets, as follows:

☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))

_____ , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
22 June 2004 (22.06.2004)	18 November 2004 (18.11.2004)
Name and mailing address of the IPEA/ US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703)305-3230	Authorized officer Michelle L. Cowen Albert DeCady Telephone No. (571) 272-3819

Form PCT/IPEA/409 (cover sheet)(January 2004)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International Application No.
PCT/US03/38223

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1(b))

☐ publication of the international application (under Rule 12.4)

☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:
pages 1-8 and 11-38 as originally filed/furnished
pages* 9 and 10 received by this Authority on 22 October 2004 (22.10.2004)
pages* NONE received by this Authority on _____

☒ the claims:
pages 43,45,50 and 53 as originally filed/furnished
pages* NONE as amended (together with any statement) under Article 19
pages* 39-42,44,46-49,51 and 52 received by this Authority on 22 October 2004 (22.10.2004)
pages* NONE received by this Authority on _____

☒ the drawings:
pages 1/12-12/12 as originally filed/furnished
pages* NONE received by this Authority on _____
pages* NONE received by this Authority on _____

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☒ The amendments have resulted in the cancellation of:

☒ the description, pages NONE
☒ the claims, Nos. NONE
☒ the drawings, sheets/figs NONE
☒ the sequence listing (*specify*): NONE
☒ any table(s) related to the sequence listing (*specify*): NONE

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____
☐ the claims, Nos _____
☐ the drawings, sheets/figs _____
☐ the sequence listing (*specify*): _____
☐ any table(s) related to the sequence listing (*specify*): _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US03/38223

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1-48	YES
	Claims NONE	NO
Inventive Step (IS)	Claims 1-48	YES
	Claims NONE	NO
Industrial Applicability (IA)	Claims 1-48	YES
	Claims NONE	NO

2. Citations and Explanations (Rule 70.7)

Claims1-48 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest adjusting the number of bits punctured in each of the parity bit streams by increasing the number of bits punctured in one of the parity bit streams and decreasing the number of bits punctured in another one of the parity bit streams (as in claims 1, 6, 10, 19, 25, 30, 35, 43) and biasing puncturing rates of P1 and P2 bits to avoid puncturing patterns by adding a number of non-punctured bits to the first group and decreasing the number of non-punctured P2 bits in the second group by the number of non-punctured P1 bits added to the first group (as in claims 16 and 40).

Claims 1-48 the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

---------- NEW CITATIONS ----------

Additionally, methods are described hereinafter for modifying the puncturing patterns such that performance of degraded Turbo code is restored.

[0046] In accordance with the present invention, the methods disclosed herein may be implemented in a wireless transmit/receive unit (WTRU) and/or a base station. Hereinafter, a WTRU includes but is not limited to a UE, mobile station, fixed or mobile subscriber unit, pager, or any other type of device capable of operating in a wireless environment. When referred to hereafter, a base station includes but is not limited to a base station, Node-B, site controller, access point or other interfacing deice in a wireless environment.

[0047] Figure 8 graphically depicts the SNR required to successfully decode a data block (critical SNR) with high probability versus Code Rate when biasing of parity bits P1/P2 is applied. As shown in Figure 7, it has been found that particular codes created by puncturing the rate 1/3 3GPP Turbo code exhibit poorer than expected performance, as can be seen from the peaks in the figure.

[0048] Figure 9 is a plot of the problematic regions with respect to an ordered pair (r1,r2) which are the rates of puncturing the parity streams in the first and second stages of rate matching, respectively. As can be seen, there are particular regions where the rates of puncturing of the parity streams are such that some combinations of rates are particularly problematic.

[0049] In one embodiment, puncture biasing for parity bits P1 and P2 is implemented for one stage rate matching. Figure 10 is a schematic block diagram showing circuitry 600 for 3GPP rate matching for HSDPA, using a Turbo coded HS-DSCH. The circuitry 600 implements a 3GPP rate-matching scheme for HSDPA. The circuitry 600 includes a bit separation circuit 605, a first rate matching stage 610, a virtual incremental redundancy (IR) buffer 615, a second rate matching stage 620 and a bit collection circuit 625. The first rate matching stage 610 includes a Parity 1 (P1) bit rate matching circuit 630 and Parity 2 (P2) bit rate matching circuit 635. The second rate matching stage 620 includes a systematic bit rate matching circuit 640, a Parity 1 (P1) bit rate matching circuit 645 for the second rate matching and a Parity 2 (P2) bit rate matching circuit 650 for the second rate matching. In operation, the systematic

bits, Parity 1 (P1) and Parity 2 (P2) bits are processed through the first rate matching stage 610, virtual IR buffer 615, second rate matching stage 620 and bit collection circuit 625. Note that the Parity 1 (P1) and Parity 2 (P2) bits are treated separately. The systematic bits, Parity 1 (P1) and Parity 2 (P2) bits are combined at the bit collection circuit 625 to provide a single data output N_{data}. Also note that if the number of coded bits is less than or equal to the size of the virtual IR buffer 615, the first rate matching stage 630 is transparent. The transparent first stage case and Rel-4 rate matching are considered.

[0050] In its actual implementation, it is anticipated that the different circuit functions will be executed by a common circuit or circuits, such as microprocessor circuitry, and in accordance with program instructions. The specific circuit functions used to implement the invention would therefore be a matter of choice of those configuring the circuitry within the rate matching circuitry 600.

[0051] The rate matching algorithm performs puncturing if the overall code rate is greater than 1/3 and repetition if the code rate is less than 1/3. Currently code rates greater than 1/3 are accomplished by applying the same puncturing rate to both P1 and P2 bits (to within one bit) but with different puncturing pattern phases. In order to avoid non-puncturing periodicities that have been shown to degrade the Turbo code performance, the puncturing rates for P1 and P2 be independently biased. For example, if the number of P1 bits is decreased by $\underline{\Delta}$ and the number of P2 bits is increased by $\underline{\Delta}$, the overall code rate is unchanged but the problematic non-puncturing periods can be avoided. Given this approach to avoiding the problematic code rates, an analytical expression for the requisite bias, has been derived.

[0052] A simple and efficient method of modifying the puncture patterns is biasing the number of punctured bits in P1 and P2 by adding additional puncturing to one and removing it from the other. The amount of the bias should be no more than is needed to avoid certain periodicities. In biasing the puncturing rates of P1 and P2 bits, two constraints must be met.

What is claimed is:

1. In a communications system employing a plurality of rate matching stages for processing a plurality of individual parity bit streams derived through puncturing a selected number of bits, a method of avoiding problematic Turbo code puncturing patterns, the method comprising:

(a) determining whether or not a desired code rate, used to process the parity bit streams, results in a problematic puncturing pattern; and

(b) if a problematic puncturing pattern results in step (a), adjusting the number of bits punctured in each of the parity bit streams by increasing the number of bits punctured in one of the parity bit streams and decreasing the number of bits punctured in another one of the parity bit streams.

2. The method of claim 1 wherein degradations in the quality of punctured error correction coded transmissions having a first group of parity 1 (P1) bits and a second group of parity 2 (P2) bits are identified, and step (b) further comprises:

(b1) adding punctured bits to the first group of P1 bits; and

(b2) removing punctured bits from the second group of P2 bits, wherein the puncturing rates of the P1 and P2 bits are biased by adding a number of non-punctured P1 bits to the first group and decreasing the number of non-punctured P2 bits in the second group by the number of non-punctured P1 bits added to the first group.

3. The method of claim 2 further comprising:

(c) determining a number of bits $\hat{N}$ using $\hat{N} = \left\lfloor \frac{4I}{7P} + \frac{1}{2} \right\rfloor$ wherein I is the number of bits at the input to each branch of rate matching and P is the total number of the P1 and P2 bits at the output of rate matching; and

(d) if $\left| \frac{I}{(P/2)} - \frac{7\hat{N}}{2} \right| < 1 - \frac{\hat{N}}{2} + \left\lfloor \frac{\hat{N}}{2} \right\rfloor$, calculate the bias

$$\Delta = \left| \max\left\{ \frac{I}{\left\lfloor \frac{7\hat{N}-1}{2} \right\rfloor} - \frac{P}{2}, \frac{P}{2} - \frac{I}{\left\lceil \frac{7\hat{N}+1}{2} \right\rceil} \right\} \right|$$, otherwise set $\Delta = 0$.

4. The method of claim 3, wherein non-puncturing patterns with a period of $7\hat{N}/2$ cause degradation in performance results and $\hat{N}$ is a whole number.

5. The method of claim 4 wherein the periods will be employed whenever the average non-puncturing period of P1 or P2 bits is within ±1 or ±½ of $7\hat{N}/2$ for even and odd $\hat{N}$ respectively.

6. In a communications system employing a plurality of rate matching stages for processing a plurality of individual parity bit streams derived through puncturing a selected number of bits, a method of avoiding problematic Turbo code puncturing patterns, the method comprising:

(a) adjusting the number of bits punctured in each of the parity bit streams by increasing the number of bits punctured in one of the parity bit streams and decreasing the number of bits punctured in another one of the parity bit streams; and

(b) adjusting the puncturing rates of each of the parity bit streams

while maintaining a constant overall effective coding rate by biasing the puncturing rates.

7. The method of claim 6 wherein degradations in the quality of punctured error correction coded transmissions having a first group of parity 1 (P1) bits and a second group of parity 2 (P2) bits are identified, step (a) further comprises:

(a1) adding punctured bits to the first group of P1 bits; and

(a2) removing punctured bits from the second group of P2 bits; and step (b) further comprises:

(b1) biasing the puncturing rates of the P1 and P2 bits by adding a number of non-punctured P1 bits to the first group and decreasing the number of non-punctured P2 bits in the second group by the number of non-punctured P1 bits added to the first group.

8. The method of claim 7 further comprising:

(c) determining a number of bits $\hat{N}$ using $\hat{N} = \left\lfloor \frac{4I}{7P} + \frac{1}{2} \right\rfloor$ wherein I is the number of bits at the input to each branch of rate matching and P is the total number of the P1 and P2 bits at the output of rate matching; and

(d) if $\left| \frac{I}{(P/2)} - \frac{7\hat{N}}{2} \right| < 1 - \frac{\hat{N}}{2} + \left\lfloor \frac{\hat{N}}{2} \right\rfloor$, calculate the bias

$$\Delta = \left\lceil \max\left\{ \frac{I}{\left\lfloor \frac{7\hat{N}-1}{2} \right\rfloor} - \frac{P}{2}, \frac{P}{2} - \frac{I}{\left\lceil \frac{7\hat{N}+1}{2} \right\rceil} \right\} \right\rceil$$, otherwise set $\Delta = 0$.

9. The method of claim 8, wherein non-puncturing patterns with a period of $7\hat{N}/2$ cause degradation in performance results and $\hat{N}$ is a whole number.

10. The method of claim 9 wherein the periods will be employed whenever the average non-puncturing period of P1 or P2 bits is within ±1 or ±½ of $7\hat{N}/2$ for even and odd $\hat{N}$ respectively.

11. A method of identifying degradations in quality of punctured error correction coded transmissions, the method comprising:

(a) identifying a puncturing pattern which approximates a particular code rate; and

(b) adjusting a value for anticipated degradation in accordance with the matching of the puncturing pattern and the particular code rate by increasing and decreasing the number of bits punctured in respective parity bit streams, and biasing the particular code rate.

12. The method of claim 11 wherein degradations in the quality of punctured error correction coded transmissions having a first group of parity 1 (P1) bits and a second group of parity 2 (P2) bits are identified, and step (b) further comprises:

(b1) adding punctured bits to the first group of P1 bits;

(b2) removing punctured bits from the second group of P2 bits; and

(b3) biasing the puncturing rates of the P1 and P2 bits to avoid problematic puncturing patterns by:

(i) adding a number of non-punctured P1 bits to the first group; and

(ii) decreasing the number of non-punctured P2 bits in the second group by the number of non-punctured P1 bits added to the first group.

13. The method of claim 12 further comprising:

(b) removing punctured bits from the second group of P2 bits; and

(c) biasing the puncturing rates of the P1 and P2 bits to avoid problematic puncturing patterns by:

(i) adding a number of non-punctured P1 bits to the first group; and

(ii) decreasing the number of non-punctured P2 bits in the second group by the number of non-punctured P1 bits added to the first group.

17. The method of claim 16 further comprising:

(d) using Turbo code to implement the error correction coded transmissions.

18. The method of claim 17 further comprising:

(e) identifying when a non-punctured bit pattern of the transmissions exhibits a periodic characteristic, with a period equal to a period of a semi-periodic impulse response of recursive encoding blocks of the Turbo code; and

(f) using the identified non-punctured bit patterns which exhibit a periodic characteristic to identify puncturing patterns with degraded performance.

19. A method for reducing degradations in quality of punctured error corrected code transmissions, the method comprising:

(a) identifying a puncturing pattern which approximates a particular code rate; and

(b) adjusting the parameters of the transmissions sufficiently to cause a mismatch in the puncturing pattern and the particular code rate by increasing and decreasing the number of bits punctured in respective parity bit streams, and biasing the particular code rate.

20. The method of claim 19 further comprising:

(a) a plurality of rate matching stages for processing a plurality of individual parity bit streams;

(b) means for adjusting the number of bits punctured in each stage of rate matching; and

(c) means for adjusting the number of bits punctured in each of the plurality of parity bit streams by increasing the number of bits punctured in one of the parity bit streams and decreasing the number of bits punctured in another one of the parity bit streams, and biasing the puncturing rate of a problematic puncturing pattern.

26. The system of claim 25 wherein degradations in the quality of punctured error correction coded transmissions having a first group of parity 1 (P1) bits and a second group of parity 2 (P2) bits are identified, the means for adjusting the number of bits punctured in each of the plurality of parity bit streams further comprising:

(c1) means for adding punctured bits to the first group of P1 bits;

(c2) means for removing punctured bits from the second group of P2 bits; and

(c3) means for biasing the puncturing rates of the P1 and P2 bits to avoid problematic puncturing patterns, the biasing means including:

(i) means for adding a number of non-punctured P1 bits to the first group; and

(ii) means for decreasing the number of non-punctured P2 bits in the second group by the number of non-punctured P1 bits added to the first group.

27. The system of claim 26 further comprising:

(d) means for determining a number of bits $\hat{N}$ using $\hat{N} = \left\lfloor \frac{4I}{7P} + \frac{1}{2} \right\rfloor$ wherein

I is the number of bits at the input to each branch of rate matching and P is the total number of the P1 and P2 bits at the output of rate matching;

(e) means for calculating the bias $\Delta = \left\lceil \max\left\{ \left(\frac{I}{\left\lfloor \frac{7\hat{N}-1}{2} \right\rfloor} - \frac{P}{2} \right), \left(\frac{P}{2} - \frac{I}{\left\lceil \frac{7\hat{N}+1}{2} \right\rceil} \right) \right\} \right\rceil$ if

$\left| \frac{I}{(P/2)} - \frac{7\hat{N}}{2} \right| < 1 - \frac{\hat{N}}{2} + \left\lfloor \frac{\hat{N}}{2} \right\rfloor$; and

(f) means for setting bias $\Delta = 0$ if $\left| \frac{I}{(P/2)} - \frac{7\hat{N}}{2} \right| \geq 1 - \frac{\hat{N}}{2} + \left\lfloor \frac{\hat{N}}{2} \right\rfloor$.

28. The system of claim 27, wherein non-puncturing patterns with a period of $7\hat{N}/2$ cause degradation in performance results and $\hat{N}$ is a whole number.

29. The system of claim 28 wherein the periods will be employed whenever the average non-puncturing period of P1 or P2 bits is within ±1 or ±½ of $7\hat{N}/2$ for even and odd $\hat{N}$ respectively.

30. A communications system for avoiding problematic Turbo code puncturing patterns, the system comprising:

(a) a plurality of rate matching stages for processing a plurality of individual parity bit streams;

(b) means for adjusting the number of punctured bits in each of the parity bit streams by increasing the number of bits punctured in one of the parity bit streams and decreasing the number of bits punctured in another one of the parity bit streams; and

(c) means for biasing the puncturing rates of each of the individual parity bit streams while maintaining a constant overall effective

coding rate.

31. The system of claim 30 wherein degradations in the quality of punctured error correction coded transmissions having a first group of parity 1 (P1) bits and a second group of parity 2 (P2) bits are identified, wherein the means for adjusting the number of punctured bits comprises:

(b1) means for adding punctured bits to the first group of P1 bits; and

(b2) means for removing punctured bits from the second group of P2 bits; and the means for biasing the puncturing rates comprises:

(c1) means for biasing the puncturing rates of the P1 and P2 bits to avoid problematic puncturing patterns, the biasing means including:

(i) means for adding a number of non-punctured P1 bits to the first group; and

(ii) means for decreasing the number of non-punctured P2 bits in the second group by the number of non-punctured P1 bits added to the first group.

32. The system of claim 31 further comprising:

(d) means for determining a number of bits $\hat{N}$ using $\hat{N} = \left\lfloor \frac{4I}{7P} + \frac{1}{2} \right\rfloor$ wherein I is the number of bits at the input to each branch of rate matching and P is the total number of the P1 and P2 bits at the output of rate matching;

(e) means for calculating the bias $\Delta = \left\lceil \max\left\{ \frac{I}{\left\lfloor \frac{7\hat{N}-1}{2} \right\rfloor} - \frac{P}{2}, \frac{P}{2} - \frac{I}{\left\lceil \frac{7\hat{N}+1}{2} \right\rceil} \right\} \right\rceil$ if

$\left| \frac{I}{(P/2)} - \frac{7\hat{N}}{2} \right| < 1 - \frac{\hat{N}}{2} + \left\lfloor \frac{\hat{N}}{2} \right\rfloor$; and

(f) means for setting bias $\Delta = 0$ if $\left|\frac{I}{(P/2)} - \frac{7\hat{N}}{2}\right| \geq 1 - \frac{\hat{N}}{2} + \left\lfloor \frac{\hat{N}}{2} \right\rfloor$.

33. The system of claim 32, wherein non-puncturing patterns with a period of $7\hat{N}/2$ cause degradation in performance results and $\hat{N}$ is a whole number.

34. The system of claim 33 wherein the periods will be employed whenever the average non-puncturing period of P1 or P2 bits is within ±1 or ±½ of $7\hat{N}/2$ for even and odd $\hat{N}$ respectively.

35. A communications system for identifying degradations in quality of punctured error correction coded transmissions, the system comprising:

(a) means for identifying a puncturing pattern which approximates a particular code rate; and

(b) means for adjusting a value for anticipated degradation in accordance with the matching of the puncturing pattern and the particular code rate by increasing and decreasing the number of bits punctured in respective parity bit streams, and biasing the puncturing rate of a problematic puncturing pattern.

36. The system of claim 35 wherein degradations in the quality of punctured error correction coded transmissions having a first group of parity 1 (P1) bits and a second group of parity 2 (P2) bits are identified, the means for adjusting a value for anticipated degradation further comprising:

(b1) means for adding punctured bits to the first group of P1 bits;

(b2) means for removing punctured bits from the second group of P2 bits; and

(b3) means for biasing the puncturing rates of the P1 and P2 bits to avoid problematic puncturing patterns, the biasing means including:

43. A communications system for reducing degradations in quality of punctured error corrected code transmissions, the system comprising:

(a) means for identifying a puncturing pattern which approximates a particular code rate; and

(b) means for adjusting the parameters of the transmissions sufficiently to cause a mismatch in the puncturing pattern and the particular code rate by increasing and decreasing the number of bits punctured in respective parity bit streams, and biasing the particular code rate.

44. The system of claim 43 further comprising:

(c) means for determining a capacity of a wireless transmit and receive unit (WTRU), including buffer sizes that are supported by the WTRU;

(d) means for using puncturing to remove sufficient bits to fit into the buffer; and

(e) means for adjusting an overall code rate so as to provide sufficient error correction capability, thereby providing a first rate in a first stage of puncturing and providing a second rate in a second stage of puncturing.

45. The system of claim 44, further comprising:

(f) means for increasing non-punctured bits in one of the first stage and second stage of puncturing, and decreasing non-punctured bits in another of the first stage and second stage of puncturing, thereby adding additional puncturing to one stage and removing it from the other stage.

46. The system of claim 44 further comprising:

(f) means for increasing non-punctured bits in the first stage and decreasing non-punctured bits in the second stage.

47. The system of claim 44 further comprising: